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(54) **PROCEDE ET DISPOSITIF DE FABRICATION DE TUYAUX OU DE CORPS MOULES TUBULAIRES EN BETON AU POLYMERE**

(54) **METHOD AND DEVICE FOR PRODUCING PIPES OR TUBULAR MOULDED BODIES FROM POLYMER CONCRETE**

(57) L'invention concerne un procédé de fabrication de tuyaux ou de corps moulés tubulaires en béton au polymère. Ledit procédé consiste à introduire une masse de remplissage minérale dans la cavité (6) d'un dispositif de moulage (1) vertical et comportant un noyau (3) avec différentes zones de traitement mobiles dans le sens axial ainsi qu'un surmoule (4) fixe entourant à distance le noyau. Le procédé consiste ensuite à secouer la masse de remplissage minérale et à la faire durcir. La masse minérale commence à être secouée dans la cavité (6) au début du processus de fabrication, pendant ou après le remplissage d'une partie de la cavité (6) avec la masse minérale. Lorsque la colonne de matière constituée de masse de remplissage minérale s'accroît dans la cavité (6) et lorsque la masse minérale a déjà commencé à être secouée, un apport de chaleur est effectué dans une zone de chauffage située en aval de la zone où la masse est secouée. Lorsque la masse de remplissage minérale a commencé à durcir dans la partie inférieure de la cavité (6), l'ensemble de la colonne de matière se trouvant dans la cavité (6) est déplacé vers le bas et chaque partie de la colonne en cours de durcissement est évacuée de la cavité (6). Un remplissage continu ou intermittent de la cavité (6) avec la masse minérale permet de compléter la colonne de matière et de faire passer en continu la masse minérale complétée à travers la zone où elle est secouée et à travers la zone de chauffage.

(57) In order to produce pipes or tubular bodies from polymer concrete, mineral casting compound is introduced into the mould chamber (6) of a vertical mould device (1) which comprises a mould core (3) having different, axially displaceable treatment zones and a stationary mantle (4) which surrounds the mould core at a spacing. Said mineral casting compound is then vibrated and subjected to a setting process. At the beginning of a production process, whilst part of the mould chamber (6) is being filled with mineral casting compound or thereafter, the vibration of the mineral casting compound in the mould chamber (6) is begun; as the column of material consisting of mineral casting compound grows in the chamber (6) and after the beginning of the vibrating process, heat is fed to the mineral casting compound in a heating zone following the vibrating zone; and, when the mineral casting compound has started to set in the lower part of the mould chamber (6), the entire column of material in the mould chamber (6) is moved downwards and each region which is setting is discharged from the mould chamber (6). As a result of continuous or intermittent pouring of mineral casting compound into the mould chamber (6), the column of material is replenished and the replenished mineral casting compound is continuously guided through the vibrating and heating zones.

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ABSTRACT OF THE DISCLOSURE

In order to produce pipes or tubular bodies from polymer concrete, mineral casting compound is introduced into the mould chamber of a vertical mould device which comprises a mould core having different , axially displaceable treatment zones and a stationary mantle which surrounds the mould core at a spacing. Said mineral casting compound is then vibrated and subjected to a setting process. At the beginning of a production process, whilst part of the mould chamber is being filled with mineral casting compound or thereafter, the vibration of the mineral casting compound in the mould chamber is begun; as the column of material consisting of mineral casting compound grows in the chamber and after the beginning of the vibrating process, heat is fed to the mineral casting compound in a heating zone following the vibrating zone; and, when the mineral casting compound has started to set in the lower part of the mould chamber, the entire column of material in the mould chamber is moved downwards and each region which is setting is discharged from the mould chamber. As a result of continuous or intermittent pouring of mineral casting compound into the mould chamber, the column of material is replenished and the replenished mineral casting compound is continuously guided through the vibrating and heating zones.

Claims

1. A method for the production of pipes or tubular molded objects (M; R) from polymer concrete, for which the mineral casting composition is introduced into the molding space (6) of molding equipment (1), the longitudinal central axis (2) of which is aligned vertically and which comprises a mold core (3) and a mold casing (4) surrounding this core (3) at a distance, shaken and subsequently subjected to a curing process with heating, characterized in that

- at the start of the manufacturing process, during or after the filling of a portion of the molding space (6) with mineral casting composition, the shaking of the mineral casting composition in the molding space (6) is commenced,
- as the column of mineral material composition grows along the longitudinal central axis (2) of the molding equipment (1) toward the upper end of the molding space (6) and after the shaking process of the mineral casting composition commences, heat is supplied in a heating zone (48), which follows the shaking zone (50, 51, 52) or coincides with said shaking zone,
- after the curing process in the mineral casting composition commences in the lower region of the molding space (6), the column of material is shifted downwards as a whole and its region, which is in the process of curing, is discharged from the molding space (6), and
- the column of material is supplemented by continuously or intermittently filling mineral casting composition into the molding space (6) and passing the supplemented

mineral casting composition through the shaking and heating zone (50, 51, 52; 48).

2. The method of claim 1, characterized in that, after an upper nominal height is reached in the molding space (6) and until the end of the manufacturing process of a molded object (M; R), mineral casting composition is supplied at an essentially constant rate.

3. The method of claims 1 or 2, characterized in that, to begin with, at the start of a manufacturing process, a lower part of the molding space (6) is filled with mineral casting composition.

4. The method of one of the claims 1 to 3, characterized in that the shaking and heating zones (50, 51, 52; 48) are assigned to axially, mutually superimposed sections of the mold core (3) and, during or after an initial filling of the molding space (6) with mineral casting composition, are transferred by the upwards motion of the mold core (3) relative to the mold casing (4) from a lower initial position, in which the lower end of the shaking zone (50, 51, 52) is adjacent to the lower end of the molding space (6), into an upper end position, which forms the main operating position, in which the upper end of the shaking zone is adjacent to the upper end of the molding space.

5. The method of one of the claims 1 to 4, characterized in that the shaking and/or the heating zones (50, 51, 52; 48) extend essentially over the height of the molding space (6) and are optionally activated and deactivated in superimposed partial regions.

6. The method of one of the claims 1 to 5, characterized in that the column of material is supported with its lower end on a closing part (14; 14') forming

the boundary of the lower end of the molding space (6) and, after the curing process is initiated in the part of the mineral casting composition adjacent to the closing part, is lowered continuously or in several steps parallel to the longitudinal central axis (2) of the molding space (6) together with the closing part (14; 14') over a total path length, which corresponds essentially to the nominal length of the molded object (M; R), which is to be produced.

7. The method of claims 1 or 2, characterized in that, at the start of a production process, at first an upper part of the molding space (6), bounded at the bottom by a closing part (14') in the annular space between the mold casing (4) and the mold core (3), is filled with mineral casting composition, the mineral casting composition in this part of the molding space (6) is shaken and, after reaching the upper nominal height, the column of mineral casting composition is lowered continuously into the lower part of the molding space (6), where it is heated and, after the curing process is initiated in the part of the mineral casting composition adjacent to the closing part (14'), the column of material, together with the closing part (14'), is lowered parallel to the longitudinal central axis (2) of the molding space (6) continuously or in several steps over a total path length, which corresponds essentially to the nominal length of the molded object (15), which is to be produced.

8. The method of one of the claims 1 to 7, characterized in that, while mineral casting composition is being supplied to the molding space (6), the latter is swiveled alternatingly about the longitudinal central axis (2) of the molding equipment (1).

9. The method of one of the claims 1 to 8, characterized in that the mineral casting composition in the heating zone (48) is heated exclusively or additionally by being acted upon with electromagnetic microwaves.

10. The method of one of the claims 1 to 9, characterized in that the mineral casting composition in the molding space (6) is kept separate from the mold core (3) and the mold casing (4) on the inside and the outside by separating means.

11. The method of claim 10, characterized in that, as separating means, mutually overlapping sheets of film (33, 34), completed into a tubular curtain, are used.

12. The method of one of the claims 1 to 11, characterized in that a mineral casting composition is used which, by the addition of a curing agent, offers an initiating temperature for the curing process lying in the range of 50 to 90° and particularly of 60 to 70° and to which a curing accelerator is added.

13. An apparatus for producing pipes or tubular molded bodies (15) from polymer concrete, with molding equipment (1) with a vertical, longitudinal central axis (2), which comprises a mold core (3) and a mold casing (4) with a molding space (6) between these, as well as filling equipment (5) for supplying mineral casting composition from above into the molding space (6), shaking equipment (55) and heating equipment (46, 47), characterized in that

- the mold casing (4) has a stationary part (7) with an axial length, which corresponds to a fraction of the length of the molded object (15), which is to be produced,
- the mold core (3) offers different treatment zones, including heating (48) and shaking (50, 51, 52) zones,
- the active, treating regions of the treatment zones (48; 50, 51, 52) can be shifted axially and

– for the lower termination of the molding space (6), a closing part (14; 14') is provided, which can be lowered from an upper initial position parallel to the longitudinal central axis (2) into a lower end position by a distance, which corresponds essentially to the nominal length of a molded object (M; R), which is to be produced.

14. The apparatus of claim 13, characterized in that the treatment zones are disposed in axially limited longitudinal sections and, for shifting the treatment zones relative to the mold casing (4), the mold core (3) can be moved axially out of a lower initial position into an upper end position.

15. The apparatus of claims 13 or 14, characterized in that, for shifting the treatment zones relative to the mold casing (4), the treatment zones can be shifted or expanded laterally.

16. The apparatus of one of the claims 13 to 15, characterized in that the parts (3, 4, 14) of the molding equipment (1), forming the boundary of the molding space (6), are mounted, so that they can be swiveled alternatingly as a whole about the longitudinal central axis (2), and the outlet (26) of the filling equipment (5) discharges stationarily in the region above the molding space (6).

17. The apparatus of one of the claims 13 to 16, characterized in that the mold casing (4) is divided in a plane extending at right angles to the longitudinal central axis (2) into two parts (7, 9), of which the lower

18. The apparatus of claim 16, characterized in that the lower part (9) of the mold casing (4) forms the outer mold of the socket part.

19. The apparatus of one of the claims 13 to 18, characterized in that the closing part (14) comprises a supporting panel (15), which can be moved up and down vertically.

20. The apparatus of claim 19, characterized in that the closing part (14) comprises an inner mold (16) of the socket part, supported on a supporting panel (15).

21. The apparatus of one of the claims 17 to 20, characterized in that the lower part (9) of the mold casing (4) is supported on the supporting panel (15) and can be lowered with this panel (15) from the upper starting position into the lower end position.

22. The apparatus of one of the claims 17 to 21, characterized in that the half parts (10, 11) of the lower part (9) can be transferred to the lower end position of the closing part (14) in its demolding position and, in this demolding position, can be raised upwards together with the closing part (14) into an intermediate position at the

level of their operating position and subsequently moved horizontally in opposite directions into the operating position.

23. The apparatus of one of the claims 13 to 19, characterized in that the supporting panel (15) of the closing part (14) is supported on a lifting table (23), movable along vertical guides, by means of a mounting device (28), so that it can be swiveled about the longitudinal central axis (2) of the molding equipment (1).

24. The apparatus of one of the claims 13 to 23, characterized in that the upper part (7) of the mold casing (4) is supported by means of a mounting device (26) on a support (27), so that it can be swiveled about the longitudinal central axis (2) of the molding equipment (1).

25. The apparatus of one of the claims 13 to 24, characterized in that the mold core (3) can be shifted vertically along a central guiding element (29) and the central guiding element (29), in the region of its upper end, is supported by a mounting device (30), so that it can be swiveled about the longitudinal central axis (2).

26. The apparatus of one of the claims 13 to 25, characterized in that the mold core (3), the mold casing (4) and the closing part (14) can be swiveled synchronously and alternately by driving equipment (3a; 7a; 9a).

27. The apparatus of claim 26, characterized in that the swiveling angle is about 300°.

28. The apparatus of one of the claims 13 to 27, characterized in that groups of supply rolls (31; 32) for the film strips, which form film curtains (33, 34)

lining the molding space (6) on the inside and the outside, are assigned to the mold core (3) and the upper part (7) of the mold casing (4).

29. The apparatus of claim 28, characterized in that the supply rolls (31), assigned to the mold core (3), are mounted on a carrying frame (35), which is supported at the central guiding element (29) for the mold core (3).

30. The apparatus of claims 28 or 29, characterized in that the supply rolls (32), assigned to the upper part (7) of the mold casing (4), are mounted on a carrying frame (36), which is supported at the upper part (7).

31. The apparatus of one of the claims 28 to 30, characterized in that annular suction adhesion regions (37, 38, 39, 40), for fastening the film, are provided in the region of the lower edge of the inner wall (8) of the upper part (7) of the mold casing (4), of the upper edge of the inner wall of the lower part (9) of the mold casing (4), of the lower edge of the outer wall of the mold core (3) and of the rear wall, facing the mold core (3), of the inner mold (16) of the socket part of the closing part (14).

32. The apparatus of one of the claims 28 to 31, characterized in that an apparatus (43) for severing the film curtains (33, 34) in a plane transversely to the longitudinal central axis (2) of the molding equipment (1) and at a specified distance below the underside of the upper part (7) of the mold space (4) and above the upper end of a finished molded object.

33. The apparatus of one of the claims 13 to 32, characterized in that the inner mold (16) of the socket part of the closing part (14) consists of a number of mold segments (45), which are disposed concentrically to the longitudinal central axis (2), are supported to a limited extent radially displaceably and can be shifted radially between an operating-position and a demolding position by means of a driving mechanism (16a).

34. The apparatus of one of the claims 13 to 33, characterized in that mold casing (4) and/or the mold core (3) have/has a heating zone, which is formed by microwave generators (47) or comprises such generators (47) as additional heat generators.

35. The apparatus of one of the claims 30 to 34, characterized in that the closing part (14') comprises a separator (60), which can be inserted from above into the molding space (6) between the mold casing (4) and the mold core (3) and forms the lower boundary of the molding space (6).

36. The apparatus of claim 35, characterized in that the separator (60) is constructed as a ring part, which forms at least one adjacent end (61) of a molded object (R) into a spigot or similar end.

37. The apparatus of claims 35 or 36, characterized in that the separator (60) is provided on the inside and the outside with a peripheral indentation (64; 65) for engagement by film separating elements.

38. The apparatus of one of the claims 35 to 37, characterized in that the separator (60) has outwardly open holding pockets (66) for a radial engagement of intermediate supporting element (67).

39. The apparatus of one of the claims 35 to 38, characterized in that the separator (60) is divided into several segments (70) in the vertical direction.

40. The apparatus of one of the claims 35 to 39, characterized in that the separator (60) consists of plastic, is provided in the region of the upper side and the underside with venting openings and has sealing lips along at least individual outer border edges.

41. The apparatus of one of the claims 35 to 40, characterized in that, below the mold casing (4) and the mold core (3), film-severing equipment (75) with an inner and an outer severing tool (76, 77) is provided, by means of which the inner and outer film curtain (33, 34) can be severed in a common horizontal plane,

42. The apparatus of claim 40, characterized in that each severing tool (76, 77) comprises a number of radially directed cutting knives (78), which can be moved by means of a driving mechanism (79) from a neutral position into an operating position and, in the operating position, can be swiveled alternately about the longitudinal central axis (2) of the molding equipment (1).

43. The apparatus of claims 41 or 42, characterized in that the inner severing tool (76) is fastened to the underside of the mold core (3).

44. The apparatus of one of the claims 41 to 43, characterized in that the outer severing tool (77) is supported at an outer supporting ring (86), which is suspended at the underside of the mold casing (4).

45. The apparatus of one of the claims 39 to 44, characterized in that the intermediate holding elements (67) for the separator (60) can be moved by means of a driving mechanism (89) out of a neutral position radially inwards into engagement with the holding pockets (66) of the separator (60) and are supported together with their driving mechanisms at the outer supporting ring.

46. The apparatus of claim 44, characterized in that the outer supporting ring (86) is supported at guides (87) so that it can be moved parallel to the longitudinal central axis (2) of the molding equipment (1) and can be moved by means of a driving mechanism (88) between an upper end position and a lower end position.

47. The apparatus of one of the claims 35 to 46, characterized in that, at its upper side, the supporting panel (15) carries fastening jaws (90), which can be moved by means of a driving mechanism (91) from a neutral position radially inwards into engagement with the lower end of a molded object (R), which is supported on the supporting panel (15).

48. The apparatus of one of the claims 13 to 47, characterized in that discharging equipment (92) for finished molded bodies (R) is provided, which comprises a gripper, which takes hold of the outside of a finished molded object (R), is supported on the supporting panel (15) in the lower end position and disposed on a horizontally movable frame (96).

49. The apparatus of claim 48, characterized in that two groups of suction grippers (93, 94), disposed one above the other, are provided which, in the starting position of the grippers, lie diametrically opposite to one another and to the molded object (R), can be moved by means of a driving mechanism (95) from a neutral position radially inwards into contact with the molded body (R) and acted upon by means of a vacuum.

50. The apparatus of claims 48 or 49, characterized in that the frame (96) of the discharging equipment (92) can be moved along horizontal guides (97) from a take-over position into a delivery position laterally next to the molding equipment (1).

51. A socket pipe of polymer concrete, characterized in that it consists of a tubular main part (100) and a separately formed socket part (101; 101'; 101"), the socket part (100) surrounds the socket end of the main part (100) with a connecting region (102) and both parts are connected together without a joint in the region of mutually opposite surfaces.

52. The socket pipe of claim 51, characterized in that the socket part (101') is joined to the socket end of the main part (100) by casting.

53. The socket pipe of claim 51, characterized in that the socket part (100, 101") is glued to the main part (100).

54. The socket pipe of claim 52, characterized in that a polymeric casting composition, which is identical or compatible with the polymeric component of the polymer concrete, is provided as adhesive.

55. The socket pipe of one of the claims 51 to 54, characterized in that the socket end of the main part (100) is provided on the outside with a recess (105).

56. The socket pipe of one of the claims 53 to 55, characterized in that the socket part (101, 101"), on the inside in the region of overlap with the main part (100), is provided with a peripheral recess.

57. The socket pipe of one of the claims 51 to 56, characterized in that the socket part (101") has a peripheral ring land (103), which protrudes radially inwards and the internal diameter of which is identical with the internal diameter of the main part (100).

METHOD AND APPARATUS FOR PRODUCING MOLDED OBJECTS FROM POLYMER CONCRETE

The invention relates to a method and an apparatus for producing pipes or similar tubular molded objects from polymer concrete. The invention furthermore relates to a coupling pipe of polymer concrete.

In practice (ÖKO-FILTER Brochure of the Lausitzer Braunkohle AG), for the production of pipes from polymer concrete, molding equipment is used, which consists of a mold core and a mold casing, which together form the boundary of a molding space. The molding space of the molding equipment, the main axis of which is aligned vertically, is filled with a mineral casting composition by means of filling equipment and this mineral casting composition is subsequently shaken as a whole. Sometime after the end of the shaking process, the mineral casting composition, which is at ambient temperature, commences to cure. After the curing process is largely concluded, the molding equipment casing is removed from the molded object. Since the pipe shrinks as it cures and, during the slow course of the curing process, the casing cannot be removed from the pipe before considerable shrinkage occurs, a sleeve-like compensating body, which then lines the finished pipe as liner, must be placed on the mold core.

operating position into nonoperative position and transposed in this position. The mold core is divided into axially limited sections, which form different treatment zones, it being possible to move the mold casing and mold core relative to one another in the axial direction during the production of a molded object.

It is an object of the invention to provide a method and an apparatus for producing molded objects, particularly a socket pipe, from polymer concrete. The method and apparatus are to enable tubular molded objects to be produced from polymer concrete with little operational and structural expense.

Pursuant to the invention, this objective is accomplished by a method with the distinguishing features of claim 1 and an apparatus with the distinguishing features of claim 13 and a socket pipe with the distinguishing features of claim 51. Further developments of the method arise from claims 2 to 12, of the apparatus from claims 14 to 50 and of the socket pipe from claims 52 to 57.

The invention enables pipes and tubular molded objects to be produced with a continuous or quasi continuous formation of the molded object in a molding space, which is stationary at least in the main part and which is traversed by the column of mineral casting composition. At the same time, the column of material is molded, solidified and cured. The structural expense of the molding equipment is exceedingly low, so that advantageous operating processes as well as simple retrofitting possibilities arise for the production of molded objects of different dimensions.

Further advantages and details of the invention arise out of the following description and the drawing, in which two examples of inventive molding equipment are shown diagrammatically. In the drawing,

object in a molding space, which is stationary at least in the main part and which is traversed by the column of mineral casting composition. At the same time, the column of material is molded, solidified and cured. The structural expense of the molding equipment is exceedingly low, so that advantageous operating processes as well as simple retrofitting possibilities arise for the production of molded objects of different dimensions.

For the production of clay pipes, equipment is known, the molding equipment of which has a vertical, longitudinal, central axis, a mold core and a mold casing with a molding space between these. The mold core and the mold casing form the boundary of the coupling region of the clay pipe, the mold core at the same time forming a closing element, which closes off the molding space at the bottom. To form the coupling region of the clay pipe, the molding space is filled with clay composition by a press plunger, after which the mold core is lowered axially by means of a table and, at the same time, the cylindrical part of the clay pipe is formed by extrusion of clay composition through an annular gap. Similar equipment for producing tubular pottery bodies, for which the cylindrical part, after being extruded, is severed by a wire cutter, is

known from the FR-A- 635 706. In the case of extrusion equipment for producing clay pipes, known from the US patent 2,789,334, a cutting knife, which can be rotated about the extrusion axis, is provided for the core part of the mouth piece. The cutting knife can be moved from a starting position within the extruded clay pipe radially outwards into a cutting position and severs the clay pipe by a rotational movement. Clay pipes, produced with the aforementioned equipment, pass through a dryer and a firing furnace after they are molded for the purpose of curing them.

Further advantages and details of the invention arise out of the following description and the drawing, in which two examples

of inventive molding equipment are shown diagrammatically. In the drawing,

Figure 1 shows a side view of a first embodiment of the inventive molding equipment, partially in section, in a basic position before the start of the manufacturing process,

Figure 2 shows a side view, half in section, similar to Figure 1 to illustrate parts of an initial phase of the production of the molded body,

Figure 3 shows a side view similar to that of Figure 1 to illustrate the parts at the conclusion of the manufacturing process of a molded object,

Figure 4 shows a partial, truncated, longitudinal through a length region of the upper part of the mold casing,

Figure 5 shows a section along the line V-V of Figure 4,

~~Figure 1 shows a side view of a first embodiment of the inventive molding~~ equipment, partially in section, in a basic position before the start of the manufacturing process,

Figure 2 shows a side view, half in section, similar to that of Figure 1 to illustrate parts of an initial phase of the production of the molded body,

Figure 3 shows a side view similar to that of Figure 1 to illustrate the parts at the conclusion of the manufacturing process of a molded object,

Figure 4 shows a partial, truncated, longitudinal section through a length region of the upper part of the mold casing,

~~Figure 5 shows a section along the line V-V of Figure 4,~~

Figure 6 shows a partial, truncated, longitudinal section, similar to that of Figure 4, through the lower end of the molding space,

Figure 7 shows a diagrammatic plan view of the closing part with mold segments as inner mold for the socket part,

Figure 8 shows a representation of a further embodiment of the inventive molding equipment,

Figure 9 shows a sectional enlargement of Figure 8 with a closing body in a starting position at the commencement of the manufacturing process,

Figure 10 shows a representation similar to that of Figure 8 to illustrate the molding equipment in a later phase of the operation,

Figure 11 shows an enlarged sectional representation of the molding equipment of Figure 8 to illustrate positions of the molding body in the process of formation while severing the film curtains, during the introduction of the intermediate supporting elements and after assumption of the support by these,

Figure 12 shows a representation similar to that of Figure 11 to illustrate positions of the molded object in the process of formation in consecutive phases of the continuous production process,

Figures 13 and 14 show enlarged sectional representations of the molding equipment of Figure 8 for a more detailed diagrammatic representation of the interior tool of the film-severing equipment in two mutually orthogonal viewing directions,

Figures 15 and 16 are representations similar to those of Figures 13 and 14 to illustrate the exterior tool of the film-severing equipment and its support as well as the support of the intermediate supporting elements,

Figure 17 shows a section along the line XVII-XVII of Figure 15,

Figure 18 shows a representation similar to that of Figure 12 to illustrate the position of a finished molded object directly before it is discharged from the molding equipment,

For closing off the molding space 6 at the bottom, a closing part 14 is provided, which can be lowered from an upper starting position (Figures 1 and 2) into a lower end position by a distance, which corresponds essentially to the nominal length of a molded object to be produced, which in this case is a socket pipe M. In particular, the closing part 14 comprises a ring-shaped supporting panel 15 and an inner mold 16 of the socket part, which is supported on the supporting panel 15.

The lower part 9 of the mold casing 4 is supported on the supporting panel 15 of the closing part 14 and can be lowered together with the closing part 14 from the upper starting position of the latter into the lower end position of the latter, as is illustrated in Figure 3. In the lower end position of the closing part 14, the half parts 10, 11 of the lower part 9 of the mold casing 4 can be transferred to the final demolding position, as is indicated by the arrows 17, 18, and can be raised in this demolding position together with the closing part 14 into an intermediate position (Figure 1) at the level of their operating position immediately below the upper part 7, as indicated by arrows 19, 20. From the intermediate position, the half parts 10, 11 can then be moved horizontally in opposite directions inwards into the operating position (Figure 2) (Arrows 21, 22). For this purpose, the closing part 14 is supported on a lifting table 23, which can be shifted along the vertical guides 24, which can be constructed as threaded spindles and may be driven by means of driving mechanisms indicated diagrammatically at 25.

Preferably, the parts 3, 4, 14 of the molding equipment 1 are mounted so that they can be swiveled as a whole alternately about the longitudinal central axis 2. The swiveling angle may, for example, amount to about 300°. The outlet 26 of the filling equipment 5 is stationary and discharges into the region above the molding space

6, which is open towards the top. This ensures that the molding space 6 is filled uniformly with the mineral casting composition.

Instead of this, it is, however, also conceivable to move the filling equipment 5 or its outlet 26, when the latter is formed, for example, by a hose, on a circular path in such a manner, that the outlet 26 circles above the molding space 6 about the longitudinal central axis 2 with a sector angle of about 300°.

To insure pivotability about the longitudinal central axis 2, the upper part 7 of the mold casing 4 is supported over a mounting device 26 on a stationary, annular supporting table 27 and the closing part 14 of the mold casing with its supporting panel 15 is supported over a mounting device 28 on the lifting table 23, so that the parts 7 or 9, 14 can be swiveled basically independently about the longitudinal, central axis 2. Diagrammatically shown driving mechanisms 3a, 7a, 9a, however, ensure that the parts 3, 7, 9 and 14 experience synchronous, alternating swiveling. To ensure the swiveling motion of the mold core 3, the latter is supported at a central guiding element 29, which is carried in the region of its upper end by a mounting device 30.

Groups of supply rolls 31, 32 for film strips, which form the mold curtains 33, 34 lining the molding space 6 on the inside and the outside, are assigned to the mold core 3 and the upper part 7 of the mold casing 4. The supply rolls 31, assigned to the mold core 3, are mounted on a supporting frame 35, which is supported at a central guiding element 29 for the mold core 3 and participates accordingly in the alternating swiveling motion of the central guiding element 29 with the mold core 3. The supply rolls 32, assigned to the upper part 7 of the mold casing 4, are mounted at a supporting frame 36, which is supported at an upper part 7, and participate accordingly in the alternating swiveling motion of the upper part 7 of the mold casing 4.

The film strips, which run off from the supply rolls and preferably consist of polyester, may, for example, have a width of 10 cm and overlap in the film curtain 33 or 34 by, for example, about 10 mm. After onset of the mutual overlapping and before they enter the molding space 6, the strips can be connected with one another at the edges, for example by gluing or sealing the edges. Instead of this, it is also possible to form the film curtains in each case from only two film strips or to use a tubular film and to take this tubular film from a storage bin containing tubular film folded in zigzag fashion.

Instead of lining the inside and the outside of the molding space 6 with a film or also in addition to such lining, it is possible to use a lubricant, which can emerge, for example, from delivery openings in the upper edge region of the inner wall of the upper part 7 and from delivery openings in the mold core 3 in a region close to the upper end of the molding space 6 and can coat the axial boundary surface of the molding space 6 with a film in such a manner, that the mineral material composition or the film pass by the boundary surfaces without direct contact. The lubricant can be one which, upon complete curing of the mineral casting composition, becomes a permanent component of the surface or fulfills strictly a lubricating function, when it is used in addition to a film.

In order to fix film curtains 33 and 34 during and between operational processes, annular suction adhesion regions 37, 38, 39 and 40 are provided in each case in the region of the lower edge of the inner wall 8 of the upper part 7 of the mold core 3, of the upper edge of the inner wall of the lower part 9 of the mold core 3, of the lower edge of the outer wall of the mold core 3 and of the rear wall of the inner mold 16 of the socket part of the closing part 14 facing the mold core 3. The suction adhesion regions 37, 38, 39, 40 are formed by chambers 41, which can be connected to a vacuum source and evacuated and are connected over suction openings 42 with the molding space 6.

For severing the film curtains 33, 34 in a plane, which extends at a specified distance below the underside of the upper part 7 of the mold casing 4 and above the upper end of the finished molded object M transversely to the longitudinal central axis 2, film-severing equipment (Figure 3) is provided, which is indicated diagrammatically at 43 and can have a heatable severing wire, for example, as a severing element.

At its surfaces facing the molding space 6, the inner mold 16 of the socket part of the closing part 14 can have a coating 44, which yields under shrinkage pressure. This coating 44 enables the socket part of the socket pipe M to shrink during the presence of the part 16. In addition to or instead of this, the inner mold 16 of the annular socket part may also be formed by a number of mold segments 45, which are supported from their operating position radially inwards on the supporting panel 15 and can shift radially inwards, for example, against the action of a spring, if they are acted upon by the shrinkage pressure of the curing mineral material composition. In the supporting panel 15, preferably driving mechanisms 16a are provided, by means of which the mold segments 45 of the inner mold 16 of the socket part can be moved between their operating position and an inwardly shifted demolding position, in which they are disengaged from the socket part of the socket pipe M, even when the latter shrinks. In order to offer an essentially closed boundary surface in the operating position and nevertheless to make possible the shifting from the operating position into the demolding position, relatively wide mold parting lines, in which an elastically compressible sealing element 45' is provided, may be provided between the mold segments 45, of which four are preferably provided.

The mold casing 4 can be heated over the whole height of the molding space 6 and, for this purpose, has heating means, which carry out the heating for example, by electrical means, in the walls of its upper and its lower parts 7, 9. The heating can also be accomplished by a liquid or gaseous heating medium, which can be

passed through heating ducts 46 in the upper and lower parts 7, 9 of the mold casing 4. Appropriate heating means are also provided in the mold core 3, namely in the region of a heating zone, which can extend practically over the height of the whole of the molding space 6, as in the case of the mold casing 4. Instead of this, it is also possible to provide a heating zone in the mold core 3, which heating zone, in the operating position of the mold core, commences only at a distance below the upper end of the molding space 6 and extends as far as the lower end of the molding space 6.

The mold casing 4 and/or the mold core 3 can have a heating zone 48, which comprises microwave generators 47 as heat generators. The microwave heating zone 48 preferably is assigned to the mold casing 4 in the region of its upper part 7 and, for the heating, is provided additionally with heating means of the previously mentioned type although, in principle, heating exclusively by electromagnetic microwaves is also conceivable.

The mold core 3 has a shaking zone which, at the start of a manufacturing process, initially consolidates the mineral casting composition in the lower part of the molding space adjoining the lower end of the molding space 6 and then, as the level of the mineral casting composition in the molding space 6 rises, is intended to consolidate the mineral casting composition also in upwardly adjoining regions of the molding space and, finally, in that region of the molding space 6, which adjoins the upper end of the molding space 6. This can be brought about in that, in the mold core 3, an axially limited shaking zone is formed, which is level with the lower region of the molding space 6 at the start of the manufacturing process and then, by pulling up the mold core 3, is moved into an upper end position, which adjoins the upper end of the molding space 6 and in which it then remains stationary during the further manufacturing process.

Instead of that, the shaking zone can also extend over the whole height of the molding space 6 and be formed by axially limited partial shaking zones 50, 51, 52, which are disposed one above the other and have vibrators 55, which can be switched on and off independently of one another. The partial shaking zones 50, 51, 52 can, at the same time, each embrace a separate mold core pipe section which, while retaining a joint 54, bridged by an elastic seal, is supported independently at an internal support of the mold core 3 and, in each case, carries its own vibrator 55. The mold core 3 shown has three partial shaking zones 50, 51, 52, which are separated by joints 54 from one another and from the parts of the mold core 3 adjoining above and below. Accordingly, first the partial shaking zone 50, then the partial shaking zone 51 and finally the partial shaking zone 52 can be activated by switching on the vibrator and the active region of the shaking zones can thus be extended in steps from the bottom to the top over the full height of the molding space 6. If the vibrators in the partial shaking zone 50 are switched off after the vibrators in the partial shaking zone 51 are switched on and, if the vibrators in the partial shaking zone 51 are switched off after the vibrators in the partial shaking zone 52 are switched on, then the active region of the shaking zone can also be shifted axially from the bottom to the top.

For producing a film object in the form of a socket pipe M, the half parts 10, 11 of the lower part 9 of the mold casing 4, starting out from the position of the parts in Figure 1, are initially transferred by a movement in the direction of the arrows 21, 22 into their operating position, in which the suction adhesion region 38 comes to lie opposite to the lower end of the film curtain 34 and fixes this by applying a vacuum. After that, the mold core 3 is lowered into a position, in which its suction adhesion region 39 lies opposite and is aligned with the suction adhesion region 40 of the closing part 14. In this position of the parts, the suction adhesion region 39 is deactivated and the suction adhesion region 40 activated, so that the film curtain 33 is loosened from the lower end of the mold core 3 and fixed to the closing part 14.

After this preparation of the molding equipment for the production operation, the parts of the equipment are in the position of Figure 2, in which the molding equipment 1 is then caused to swivel alternately about the longitudinal central axis 2. With or after the onset of this alternating oscillatory movement, the filling equipment 5 is set in operation and mineral casting composition is filled over the outlet 26 into the molding space 6. At this point in time, the heating zones of the mold casing 4 and of the mold core 3 are operating with the result that the boundary walls of the molding space 6 have their specified operating temperature, for example, of the order of 70 - 100°.

As the filling of the molding space 6 commences, the lowest partial shaking zone 50 of the mold core 3 is started up and the partial shaking zones 51 and 52 are switched on as soon as the level in each case reaches their lower end. With the switching on of the partial shaking zone 51, the shaking in the partial shaking zone 50 can be switched off and, with the switching on of the partial shaking zone 52, the shaking in the partial shaking zone 51 can also be switched off, so that shaking takes place now only in the region of the partial shaking zone 52.

When the nominal upper level in the molding space 6 is reached, the further supply of mineral casting composition, to begin with, is interrupted until, as a result of the heating of the mineral casting composition, the curing process commences in this composition in the region of the lower part 9 and in the lower region of the upper part 7 and leads to a first solidification of the mineral casting composition, which makes it possible to commence now with the lowering of the closing part 14 along with the lower part 9 along the guides 24. With the onset of the lowering process, the column of material in the molding space 6 as a whole commences a downward motion, which is produced by gravity and optionally supported by the pulling action on the film curtains 33, 34 and, with the start of which, the supplying of mineral casting composition by the

filling equipment 5 is resumed and metered in such a manner, that the level in the molding space 6 is maintained essentially constant at the scheduled height. As the lowering of the material column in the molding space 6 commences, the heating zone 48 additionally is activated in order to intensify the transfer of heat to the material column in motion and to ensure that, in the mineral casting composition continuously moving downwards in the molding space 6 between the upper part 7 and the mold core 3, a curing process is initiated, which generates in the mineral casting composition, emerging from the upper part 7, already such a strength that the necessary shape maintenance of the molded object M is assured during the further downwards motion.

In general, it is possible to control the shaking and heating while continuously filling the molding space and continuously lowering the column of material in such a manner, that the formation of the molded M object proceeds continually. It is, however, also conceivable to form the molded object M in steps. For example, at the start of the production process, the molding space 6 can be filled very rapidly up to a nominal height and the filling and shaking can be followed by a phase, in which the mineral material composition is merely heated. This can then be followed by a relatively rapid lowering process of the column of material with appropriate maintenance of the nominal state in the molding space 6, until approximately the whole of the preconsolidated part of the column of material is moved out of the molding space in the upper part 7. At this time, the further lowering motion of the parts 9, 14 is interrupted until the column of material, which is in the molding space in the upper part 7 at this time, has acquired the preliminary solidification, required so that it can be discharged from the molding space 6, as a result of the curing process that has been initiated. Subsequently, in a rapid lowering motion, this part of the column of material is once again essentially discharged from the molding space 6 which, while stopped, is filled with more material composition for the next discharging process, until the production of the molded object is concluded.

The question of moving the column of material continuously through the molding space 6 or moving the mineral material composition intermittently depends essentially on the formulation of the mineral casting composition and on the therefrom resulting temperature, at which the curing process is initiated, as well as on the pot life and the curing rate. Preferably, a mineral casting composition is used, which offers an initiating temperature, which is raised above ambient temperature and preferably falls in the range of about 50 to 90° and advantageously between 60 and 70° due to the addition of a curing agent, and which contains a curing accelerator, such as a cobalt accelerator, which shortens the curing process.

If, in the course of the production process conducted in the manner described above, the column of material has reached a length corresponding to the nominal length of the pipe that is to be produced, the further supply of mineral material composition is terminated by switching off the filling equipment 5 and the handling process is continued until the parts essentially have reached the position illustrated in Figure 3, in which the closing part 14 and the lower part 7 are in their final, lower position. At the same time, the upper end of the socket pipe M produced is at a specified distance below the upper part 7.

For demolding the socket pipe M, the mold core 3 is first moved upwards some distance, until the lower end of the mold core 3 is slightly above the severing plane, which is defined by the equipment 43 and in which the equipment 43 subsequently severs the film curtains 33, 34. Previously, the film curtains 33, 34 were fixed by activating the suction adhesion region 39 of the mold core 3 and the suction adhesion region 37 of the upper part 7. Thereupon, the half parts 10, 11 are moved apart horizontally as indicated by the arrows 17, 18 along the guides 12, 13 into the demolding position. At the same time, the mold segments of the inner mold 16 of the socket part are shifted inwards into their demolding position by means of the driving

mechanism 45, so that the socket pipe M, which is still surrounded on the outside and inside by film, can be removed by means of hoisting equipment and taken away for further treatments. Subsequently, the lifting table 23 is shifted upward along the guides 24 in the direction of the arrows 19, 20, until the position of Figure 1 is reached, starting out from which a new production process can now be commenced.

When pipes are produced with a cross section, which remains the same over the whole length, it is possible to do without the lower part 9 and the closing part 14 can consist essentially of the supporting panel 15 alone. The process can be controlled automatically, programmed on the basis of measurement data, such as the outside temperature of the column of material at a level equal to that of the lower end of the upper part 7, the weight or the volume of the mineral material composition supplied, the level of material in the molding space 6, the position of the closing part on its way to the lower end position, etc. Depending on the length and diameter of the pipes to be produced and on the composition of the mineral casting composition, cycle times of the order of 2 to 4 minutes can be attained.

The second embodiment of inventive mold equipment, illustrated in Figures 8 to 19, corresponds largely with that of Figures 1 to 7 and identical parts have been given the same reference numbers. Contrary to the mold equipment of Figures 1 to 7, the second embodiment of Figures 8 to 19 has a mold casing 4, which consists only of the stationary, closed upper part 7. The lower part 9 is not required, since pipes with a constant cross section or with one or two spigots or ends of a similar nature are to be produced with the second embodiment, for which changes in shape lie within the cylindrical contour of the tubular body.

The closing part 14' of the second embodiment has a basically different construction. Admittedly, it also encompasses the supporting panel 15. Primarily, however, it comprises a separator 60, which can be inserted from above into the

molding space 6 between the mold casing 4 and the mold core 3 and forms the lower boundary of the molding space 6. As can be seen, for example, in Figures 9 and 17, the separator 60 is constructed as an annular part, which molds at least one adjacent end 61 of a molded body R, which is to be formed, into a spigot. For this purpose, the separator 60 is provided with an external annular flange 62, which extends upwards from the upper side 63 of the separator 60 at the outer periphery and, with that, parallel to the adjacent inner wall 8 of the mold casing 4. In the drawing, the annular flange 62 is reproduced only diagrammatically. The exact conformation of its shape is determined by the exterior shape of the pipe end, which is to be formed. If molded bodies R are to be formed with two spigots, the separator 60 can be provided additionally with a ring shoulder (not shown), corresponding to ring shoulder 62 and extending downward.

The separator 60 is provided on the inside and outside with a peripheral indentation 64 or 65 for engagement by film severing elements, which will be dealt with in greater detail below. The separator 60 furthermore has holding pockets 66, which are open to the outside and into which intermediate supporting elements 67, which will be described in greater detail below and can be provided with a vertically aligned central slot 68, can be introduced. As a result of the slots 68, the intermediate supporting elements 67 can be introduced into two holding pockets 66 each and accommodate in their slot 68 a partition 69 between adjacent holding pockets 66.

As can be inferred from Figure 17, the separator 60 is divided in the vertical direction into several segments 70 (four in the Example shown), which make it possible to assemble the separator 60, for example, with the help of feeding equipment, the details of which are not shown, in a region immediately above the filling opening of the molding space 6 by moving the segments 70 together and then introducing the assembled separator 60 into the molding space 6 from above. Due to the segmented construction, the separator 60 can be detached at the end of the formation of the molded object from the molded object R by pulling off the segment 70 radially.

Below the mold casing 4 and the mold core 3, film-severing equipment 75 with an inner and an outer severing tool 76 and 77 respectively is provided and illustrated in some of the Figures of the drawing only by a line representing the severing plane. However, as shown particularly in Figures 13 to 16, each severing tool 76, 77 is provided with a number of radially directed cutting knives 78, which can be moved in each case by means of a diagrammatically illustrated pressure medium cylinder 79, from the neutral position shown radially (outwards or inwards) into an operating position, in which they in each case reach through the cylindrical surface of the film curtains 33 and 34 and protrude into the indentations 64 and 65 respectively of a separator 60, the horizontal central plane of which, when the film-severing equipment 75 is actuated, is level with the severing plane of the film-severing equipment 75.

In the operating position of the cutting knives 78, the severing tools 76, 77 can be swiveled alternatingly about their respective central axis, which coincides with the longitudinal central axis 2 of the molding equipment 1. The swiveling angle is selected so that the cutting knives 78 together pass through an uninterrupted circular arc.

The inner severing tool 76 is fastened to the underside of the mold core 3 and rotatably supported in a bearing part 80 and can be swiveled alternatingly by means of a driving mechanism 81. The outer severing tool 77 comprises an annular support 82, which is guided between upper and lower guide rolls 83, 84 and can be swiveled alternately by means of a pressure medium driving mechanism 85.

The guide rolls 83, 84 are supported on the upper side of an outer supporting ring 86, which is suspended from the underside of the mold casing 4. For this purpose, the outer supporting ring 86 is movably supported at the guides 87 parallel to the longitudinal central axis 2 of the mold equipment 1 and can be moved by means of a driving mechanism 88 between an upper end position and a lower end position. In

the case of a particularly simple embodiment, the guides 87 are constructed as threaded spindles, which reach through counterthreads in the outer supporting ring 86 and can be driven uniformly to one another by means of synchronous motors 88, so that the outer supporting ring 86 experiences a precisely parallel shift.

At its underside, the outer supporting ring 86 supports the intermediate holding elements 67, which in each case can be moved by means of a pressure medium driving mechanism 89 from a neutral position radially inwards into engagement with the holding pockets 66 of a separator 60. In this way, the intermediate holding elements 67, of which, for example, four, distributed over the periphery are provided, can be moved up and down for purposes, which will still be discussed further below.

At its upper side, the supporting panel 15 carries fastening jaws 90, which can be moved in each case by means of a pressure medium driving mechanism 91 from a neutral position radially inwards into engagement with the lower end of a molded body R supported on the supporting panel 15 or with the separator 60 surrounding this end, in order to secure the end of the molded body on the supporting panel 15.

For discharging finished molded bodies R from the molding equipment 1, discharging equipment 92, which is located laterally next to the molding equipment 1 in the neutral position, is provided at a height between the supporting panel 15 in its lower end position and the outer supporting ring 86. The discharging equipment 92 has two groups of suction grippers 93, 94, which are disposed mutually above one another, in the initial gripping position lie diametrically opposite to one another and to the molded object R and can be moved by means of a pressure medium driving mechanism 95 from a neutral position radially inwards in opposite directions against the molded object R and can be acted upon with a vacuum by means of a pressure medium source, which is not shown.

The grippers 93, 94 are supported at a frame 96, which can be moved horizontally and makes it possible to bring a finished molded body R, which has been taken hold of, from its position in the molding equipment 1 to a storage area, which can be formed, for example, by a further processing station, a refrigerated room or the like. The movement of the frame 96 can be brought about, for example, with the help of threaded spindles 97, which can be driven by driving motors that are not shown.

For starting up the apparatus, the film curtains 33, 34 are suspended in a molding space 6 and in the molding space 6 and, at the same time, a tubular spacer 98, which is supported on the supporting panel 15 and secured on this with the help of the fastening jaw 90, is introduced from below between the film curtains 33, 34. The separator is then introduced from above into the molding space 6 between the film curtains 33, 34 and placed on the upper end of the spacer 98.

At the start of the process for producing a molded object R, the first separator 60 is in a position relatively closely beneath a specified upper nominal height for the mineral casting composition in the molding space 6, so that, after the introduction of the mineral casting composition by means of the filling equipment 5 is commenced, the specified nominal height is soon reached. At the time at which the charging of the filling space 6 with mineral casting composition is commenced, the parts 3, 4 (including the parts connected with these) are in alternating swinging motion, so that the mineral casting composition is distributed rapidly and uniformly in the molding space 6. Furthermore, at this time, the shaking zone 52 of the mold core 3, adjoining the upper end of the molding space 6, is also already in operation, so that, as soon as the filling of the mineral casting composition is commenced, this composition is shaken in the molding space 6.

When the specified filling level is reached, the lifting table 23 is moved downward. This downward motion is coordinated by the filling equipment 5 with the

mineral casting composition supplied in such a manner, that the nominal height is constantly maintained. Above the separator 60, which is lowered with lifting table 23, a column of material is accordingly built up progressively and preferably continuously in the molding space 6 and passes first through the shaking zone 52 and then through a downwardly adjoining heating zone, in which it is exposed to heating, preferably from inside as well as from outside. In the course of the heating, the curing process is initiated. As a result, in a region above the outlet plane of the molding space 6, the molded body R, which is being formed, in each cases reaches a degree of curing, which provides the emerging end of the molded body with such a strength (for example, 20% to 25% of the final strength), that undesired shape changes are excluded.

As soon as the separator 60 reaches the region of action of the film-severing equipment 75, a downward motion is imparted to the outer supporting ring 86, which corresponds to the downward motion of the separator 60, so that there is no relative axial motion between the separator 60 and the cutting knives 78 of the film-severing equipment 75 during the subsequent severing of the film curtains 33, 34. As soon as the film severing process is concluded and the knives 78 have been returned to their neutral position, the outer supporting ring 86 returns to its upper end position, in which at this time the intermediate supporting elements 67, which are still below the separator 60, are located in one plane. As soon as the separator 60, in the course of its steady downwards motion, reaches the region of action of the intermediate supporting elements 67, the outer supporting ring 86 once again commences a synchronous downwards motion, so that the intermediate supporting elements 67 can be introduced into the holding pockets 66 of the separator 60, without there being any relative axial movement between the parts.

As soon as the intermediate supporting elements 67 engage the separator 60, they take over the supporting of the separator 60 and, with that, the supporting of the molded object R resting on it, insofar as this object has already been formed. This

makes it possible to move the lifting table 23 and the supporting panel 15 resting on this table downward at an increased rate with the consequence that the spacer 98 is freed from supporting contact with the underside of the separator 60 and that the discharging equipment 92 can commence its activity as soon as the lifting table 23 has reached its lower end position. For taking out the molded object R, the lifting table 23 with the spacer 98 is first of all lifted once again by a short distance, the suction grippers 93, 94 are brought into engagement and the fastening jaws 90 are loosened, after which the lifting table 23 once again is moved down into its lower end position. By these means, the spacer 98 is held by the suction grippers 93, 94 so that it can move freely and can be moved out of the molding equipment 1 with the help of the frame 96.

As soon as the spacer 98 is removed, the lifting table 23 is moved up once again to contact the separator 60. As soon as this contact is made, the upwards movement is converted into downward motion, which is synchronous with the intermediate supporting elements and for which the supporting panel 15 once again can assume the function of supporting the separator 60 and the molded body R above the separator 60. As soon as the fastening jaws 90 have secured the lower end of the molded object R and of the separator 60 on the supporting panel 15, the intermediate supporting elements 67 are moved back into their neutral position, whereupon the outer supporting ring 86 is returned into its upper end position.

As soon as the molded body R, which is being formed, has reached its specified length, which can be determined by measuring the path, determining the weight or in some other suitable manner (photoelectric barrier), the supply of mineral material composition is switched off and a separator 60 is deposited on the upper end of the column of material. After being introduced into the molding space 6, this separator 60 settles under gravity on the upper end of the column of material or can also be placed with the help of pressure elements on the upper end of the column of material. As soon as the new separator 60 is resting on the upper end of the column of material, the supply

of mineral casting composition is continued once again and initially carried out on a greater scale, so that shortly, despite the further downward motion of the previously formed molded body R, the column of material of the molded object R, which is to be formed next, once again attains the specified nominal height in the molding space 6. After that, the manufacturing process is continued in the manner already described; after the film curtains 33, 34 are severed and the finished molded object R, which has been removed from the molding space 6, is detached from the separator 66 above this molded body R, the latter is removed from the molding equipment 1 with the help of the discharging equipment 92 as described previously with respect to the spacer 98. The position of the molded body R, which is raised once again at the time, at which the molded body R is removed by the discharging equipment 92, is illustrated in Figure 18 by phantom lines. At the same time, Figure 11 illustrates by a phantom line the upper end of the molded object R, moved by the accelerated lowering of the lifting table 23 out of contact with the separator 60 above.

The pipes, produced with the second embodiment of the molding equipment 1, can be used as propulsion pipes or, if formed with spigots at both ends, can be assembled with the help of double sockets into a pipeline. They can, however, also be used as molded blanks for further conversion in a treatment station, in which the ends of the pipes are finished, for example, by machining.

Preferably and pursuant to the invention, molded objects, produced according to the inventive method and with the second embodiment of the molding equipment 1, are used as the main tubular component for the formation of a socket pipe, which consists of this main part and a separately constructed socket part, which surrounds the end of the main part with a connecting region, both parts being connected without a joint in the region of mutually facing surfaces.

Figures 20 to 22 show different embodiments of such polymer concrete socket pipes, which are assembled pursuant to the invention, in truncated half sections. For examples, Figure 20 shows a main part 100 in the region of an end, which is unchanged in cross section and engages a separately produced socket part 101, which surrounds with a connecting region 102 the end of the main part 100. At the same time, the socket part 101 has a peripheral ring land 103, which protrudes radially inwards and the internal diameter of which is identical with the internal diameter of the main part 100. The socket part 101 is dimensioned so that a gap region 104 remains between the mutually opposite surfaces of the main part 100 and of the socket part 101. The gap region 104 is filled with a polymer casting composition as adhesive, which is identical or at least compatible with the polymer component of the polymer concrete and forms an intimate connection.

For the embodiment of the socket pipe of Figure 21, the socket part 101' is joined to the end of the main part 100 by casting, a solid, joint-free connection also being formed. To increase the strength of the joint, the socket end of the main part 100 can be provided at the outside with a recess 105 which, if necessary, can also be provided for the embodiment of the socket pipe of Figure 20.

Figure 22 illustrates an embodiment, for which both ends are constructed as a type of spigot with a recess 105 and 106. In the case of the example shown, the recess serves to accommodate a seal 107. The socket part 101" is shaped particularly simply and can be glued by means of a polymeric compound casting composition in the gap 104' to the socket end of the main part 100. For increasing the strength of the connection, the socket part 101" can also be provided on the inside, in the connecting region 102, with an appropriate recess, which may also be provided in the connecting region 102 of the embodiment of Figure 20. A polymer concrete composition, which has a slump test value that permits a flow into the joint gap regions 104, 104' can also be used as polymeric casting composition.

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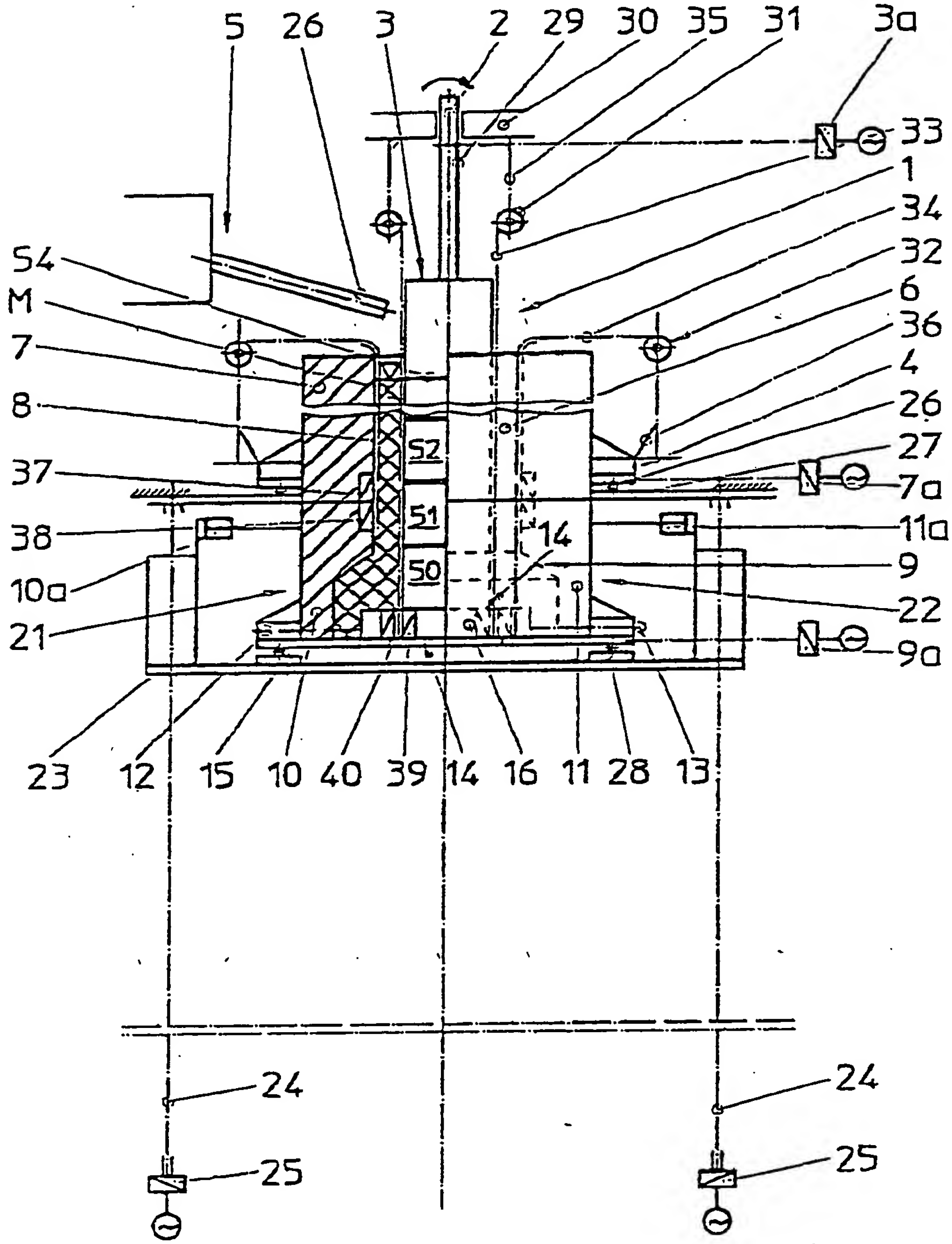

Fig.2

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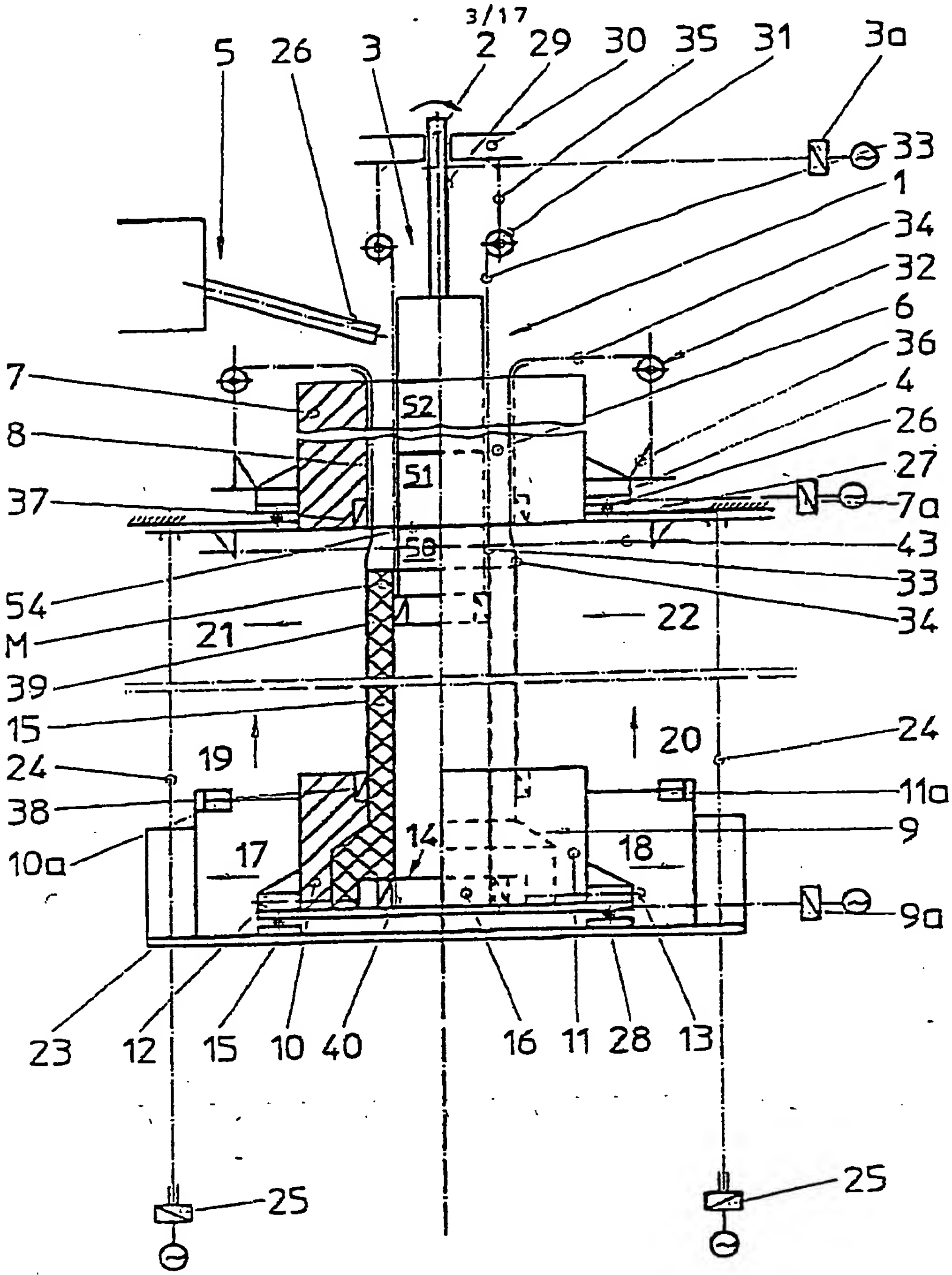

Fig.3

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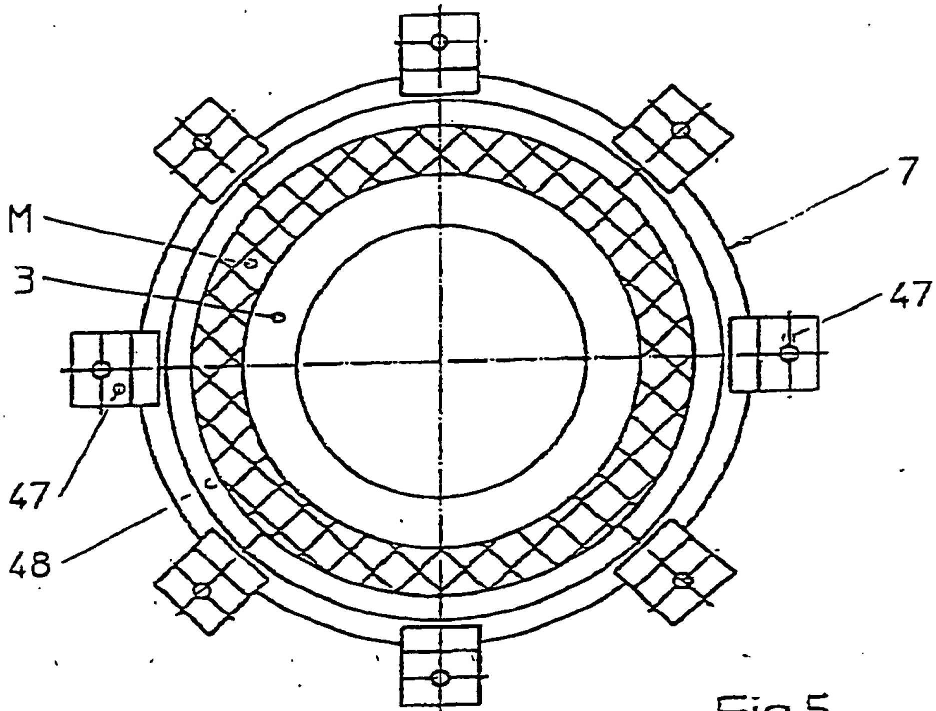

Fig.5

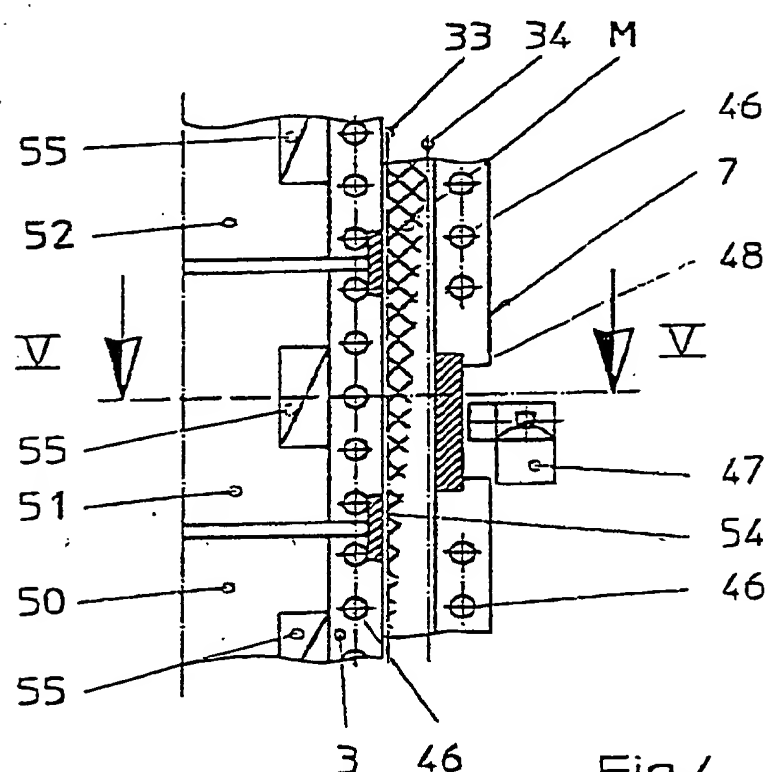

Fig.4

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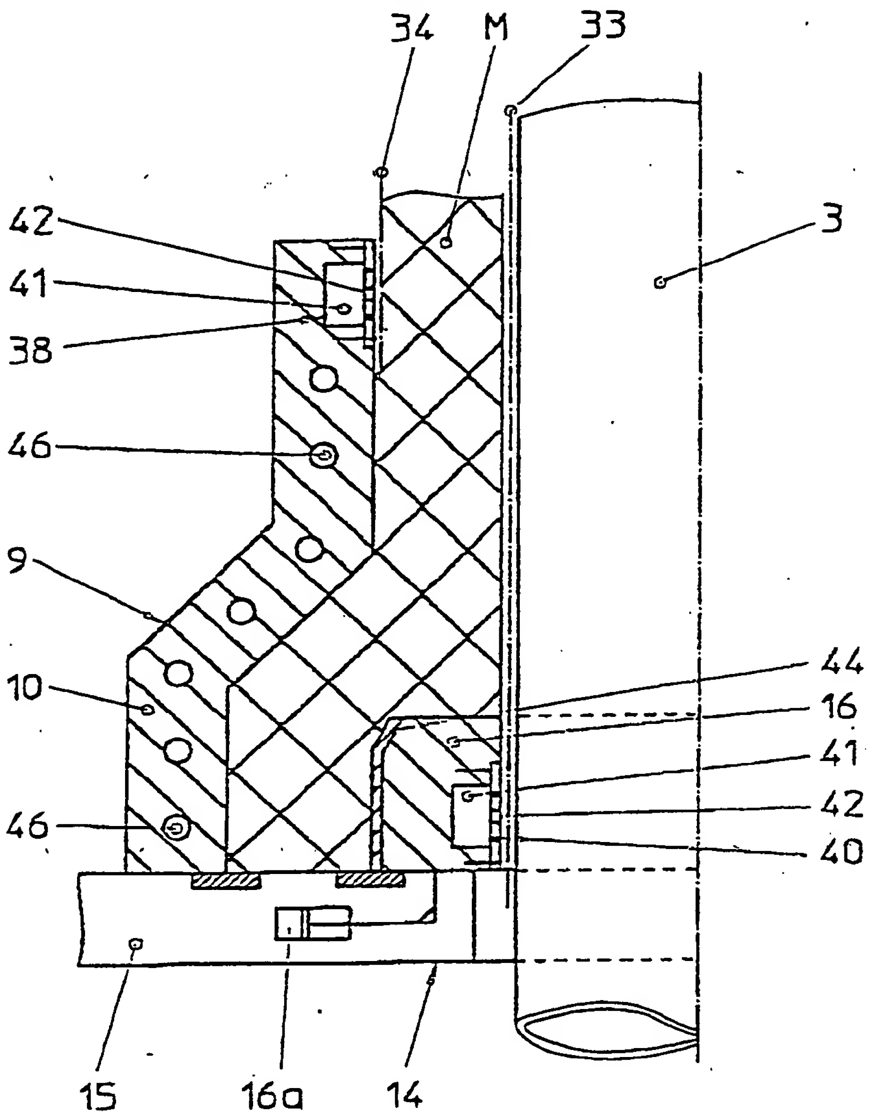

Fig.6

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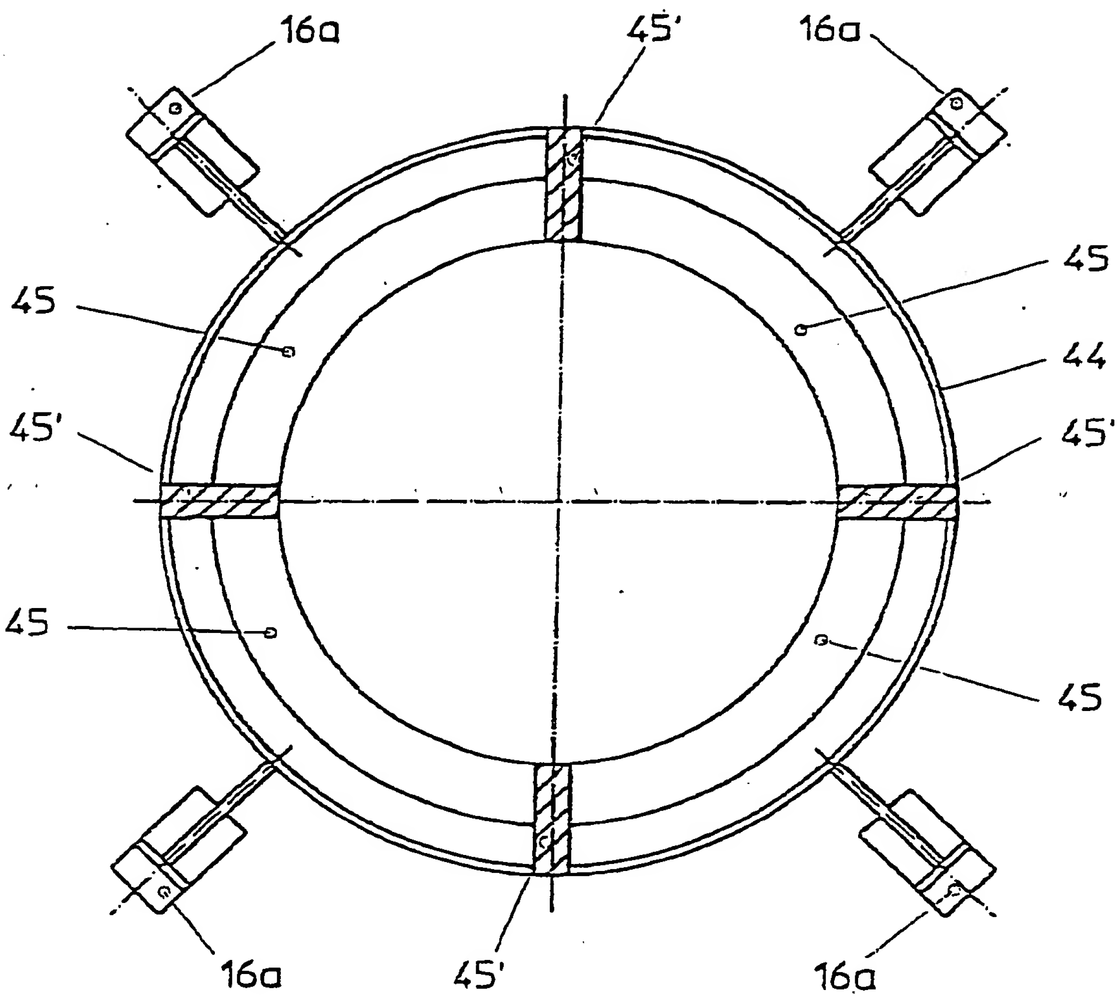

Fig.7

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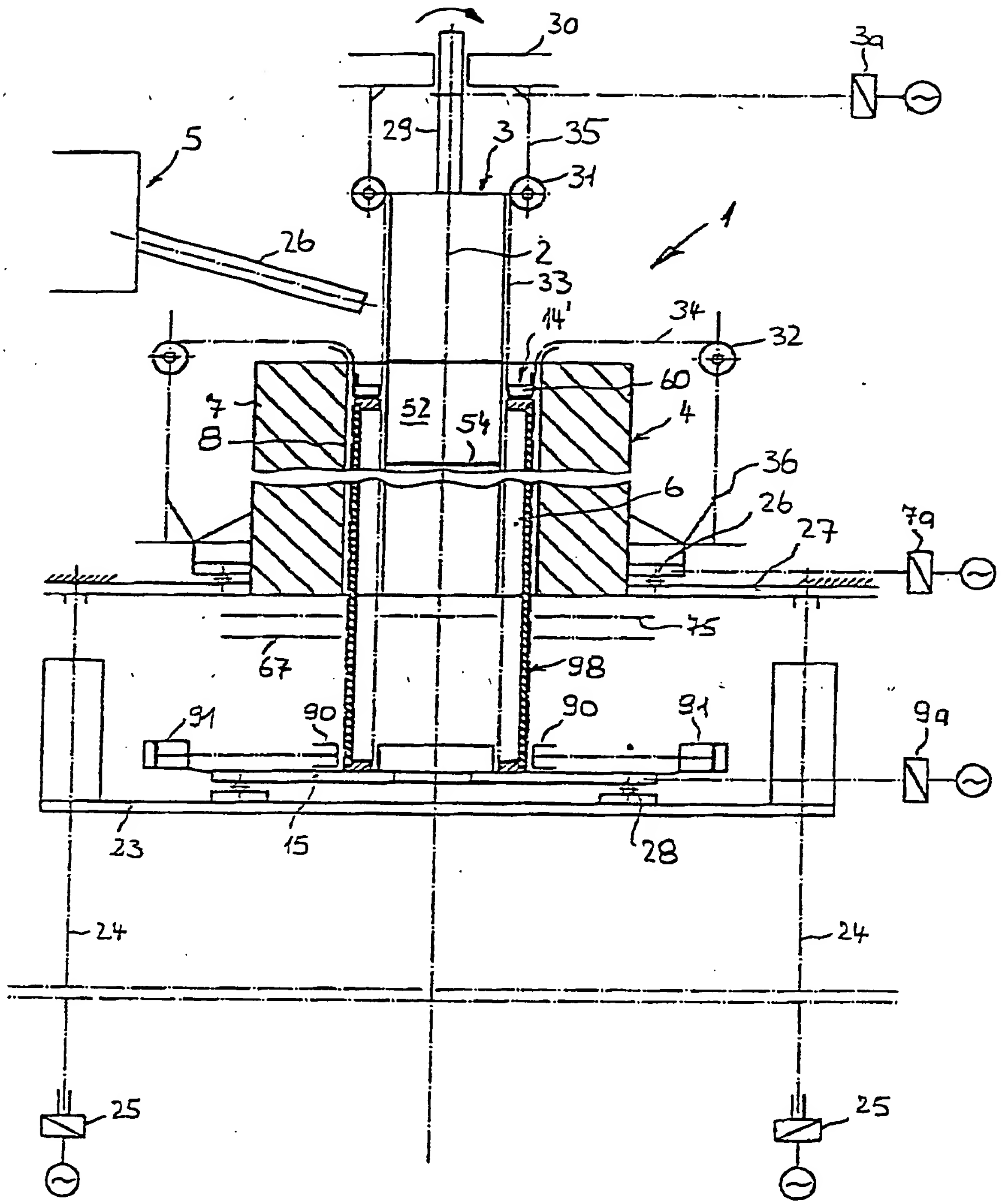

FIG. 8

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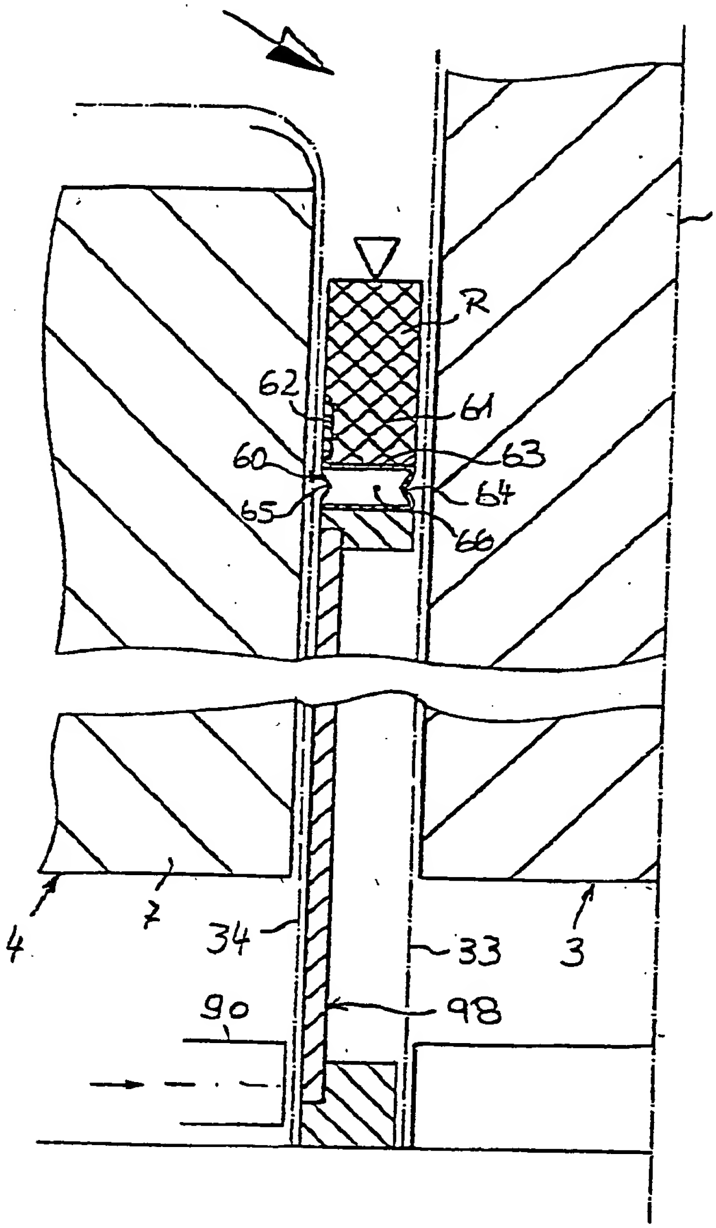

FIG. 9

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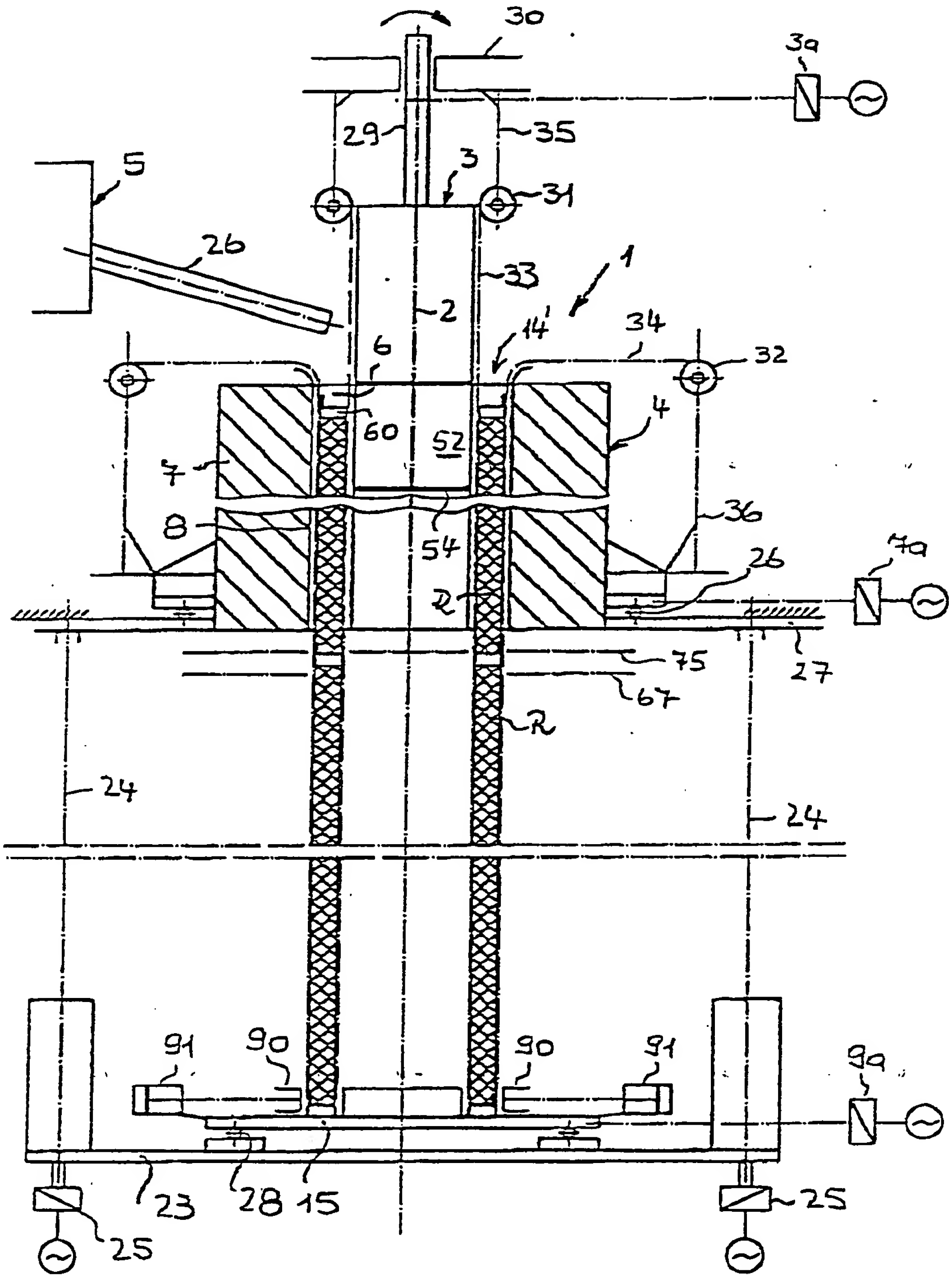

FIG. 10

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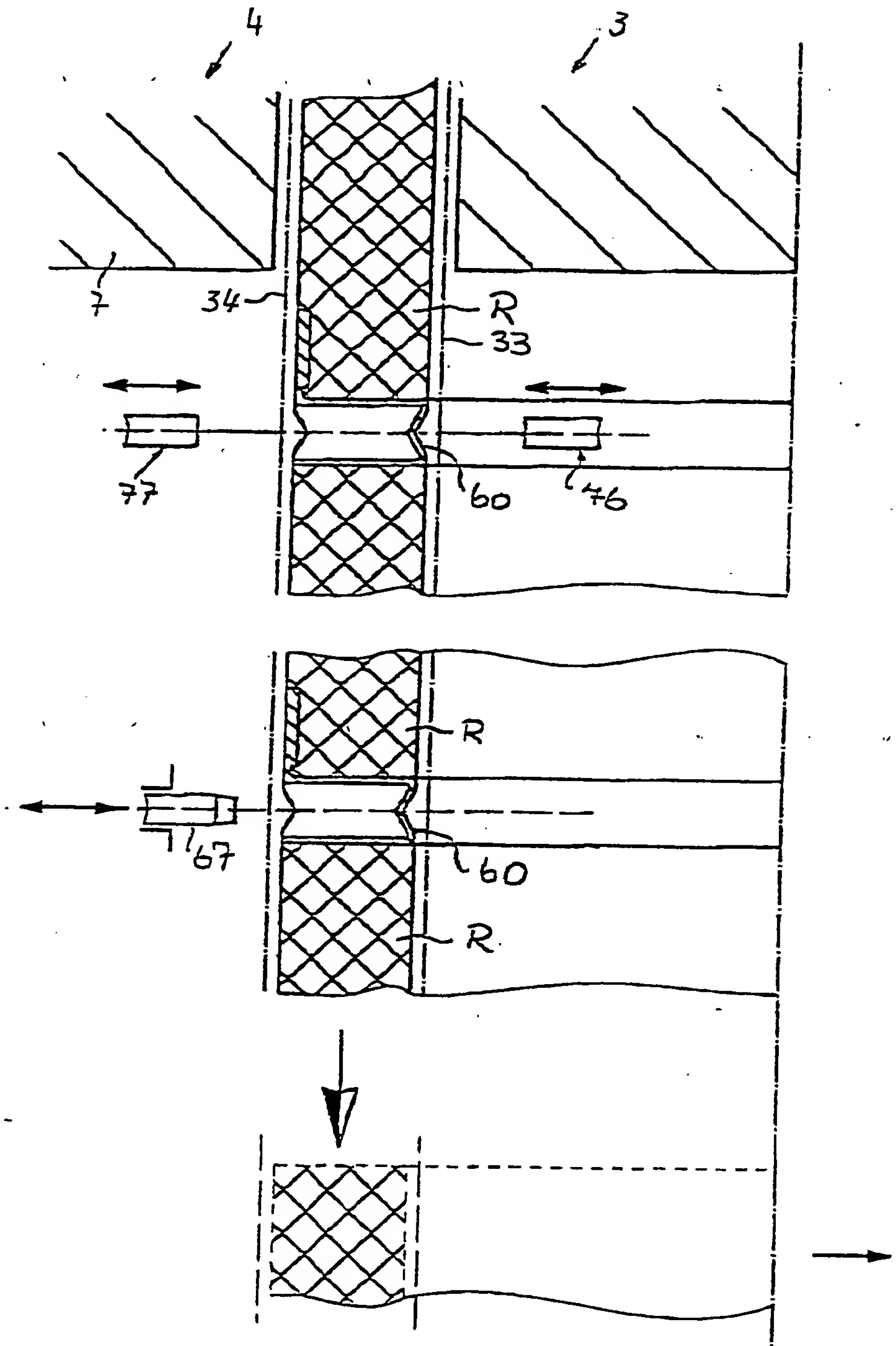

FIG. 11

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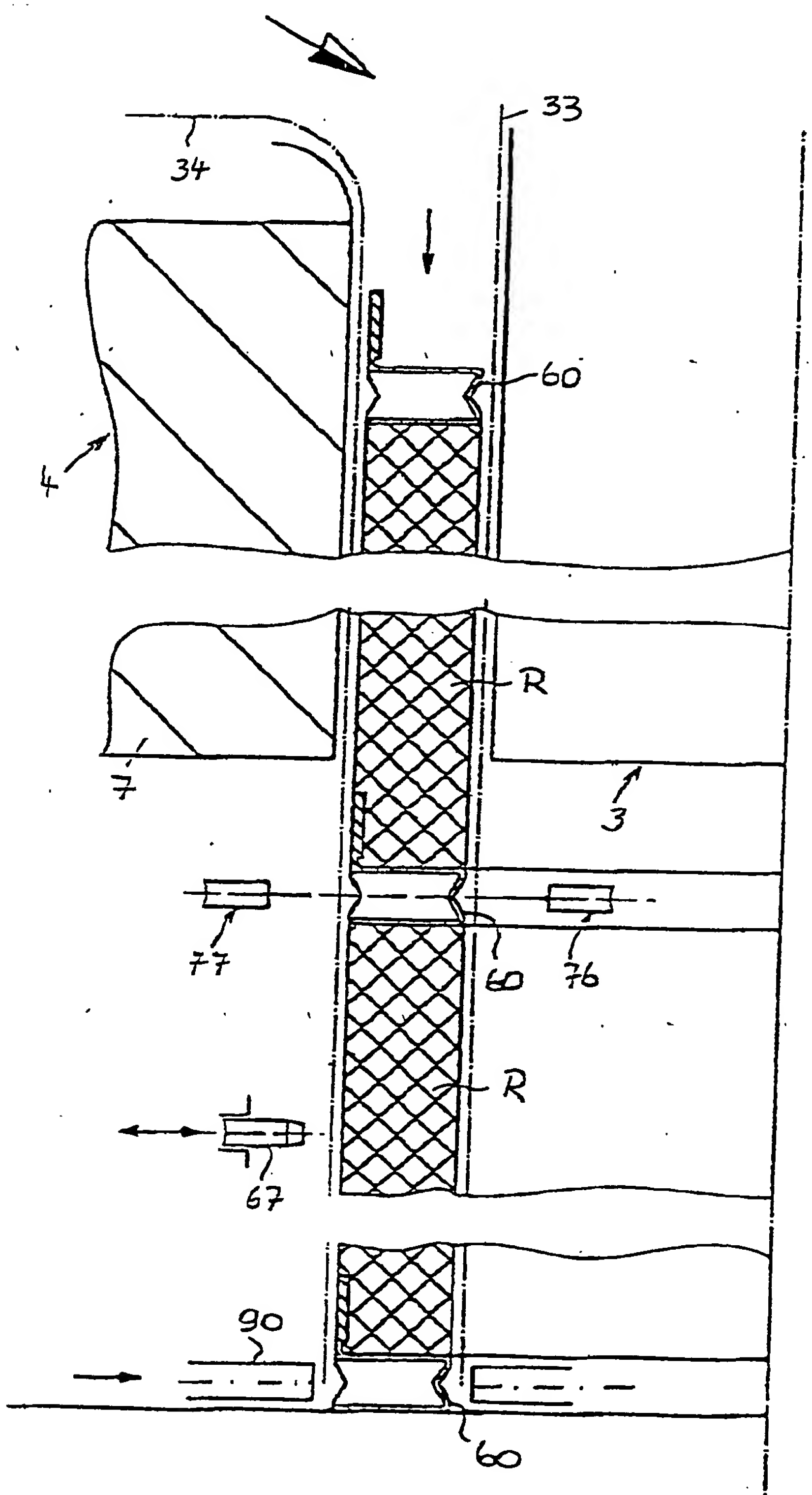

FIG. 12

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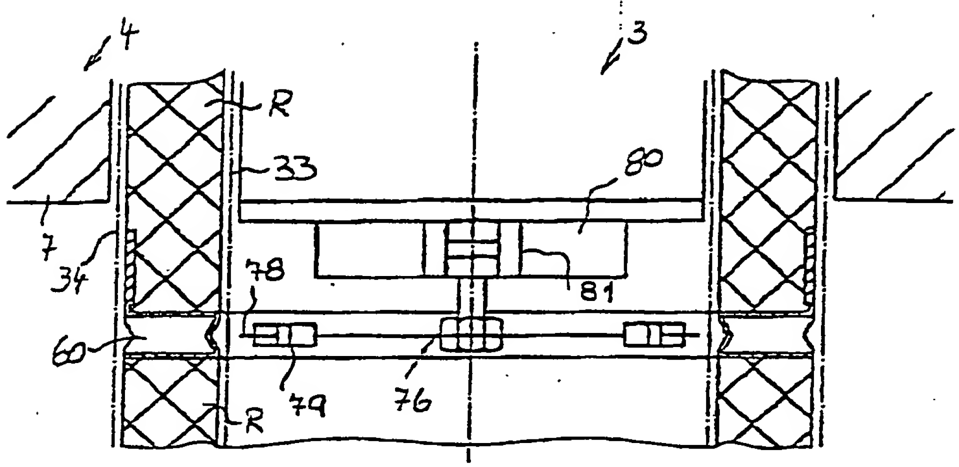

FIG. 13

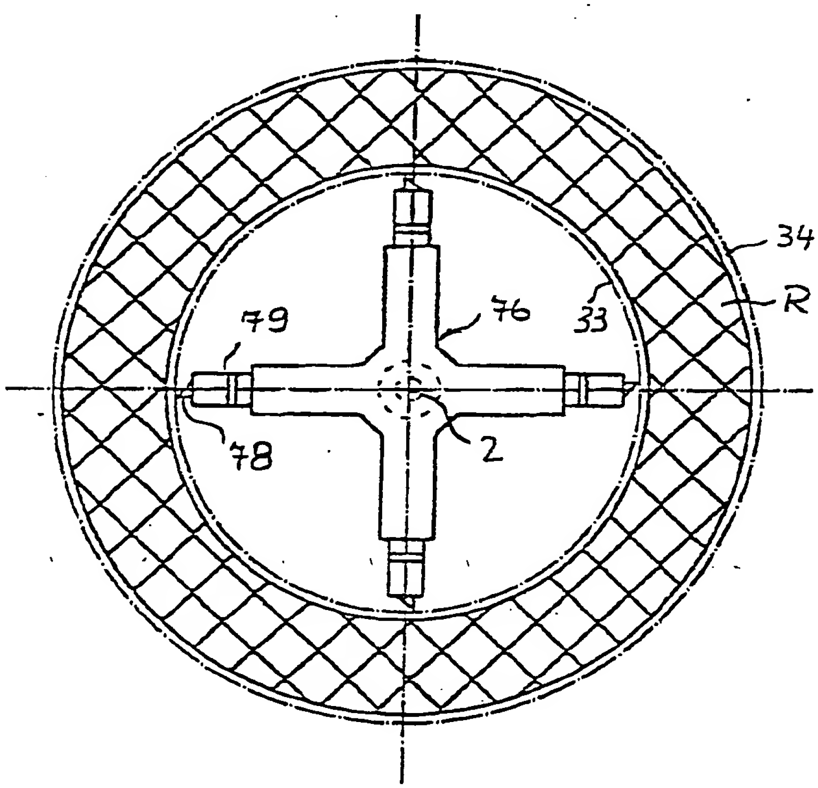

FIG. 14

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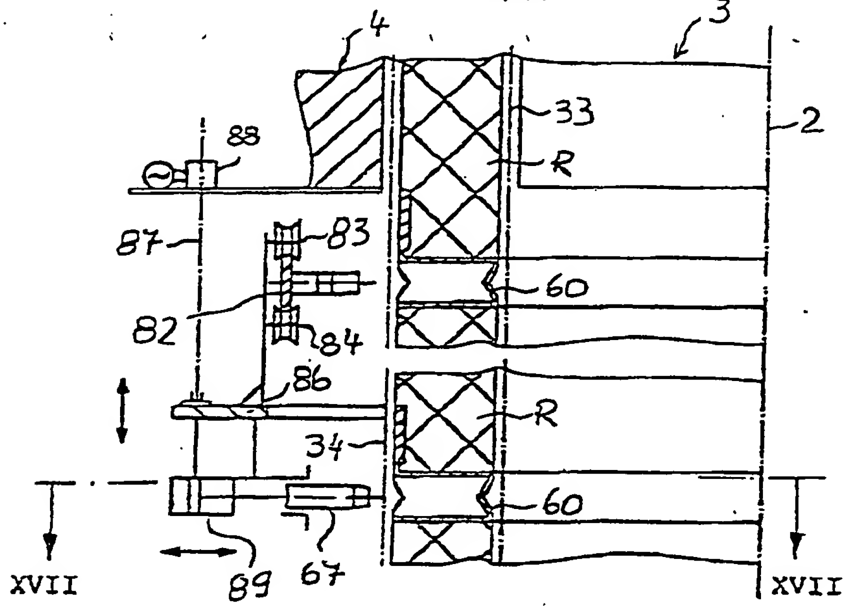

FIG. 15

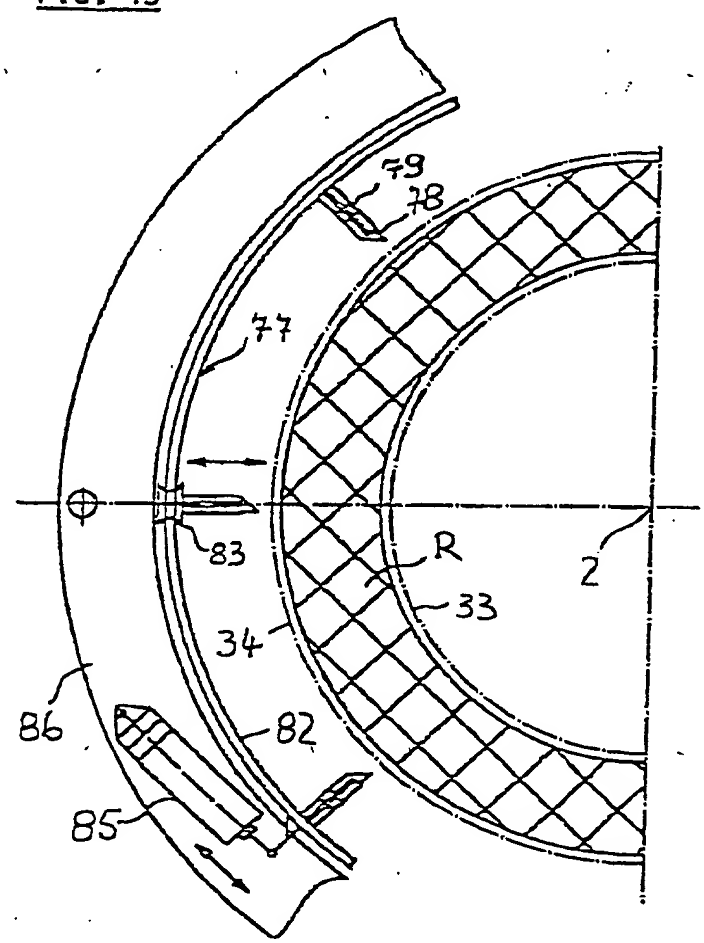

FIG. 16

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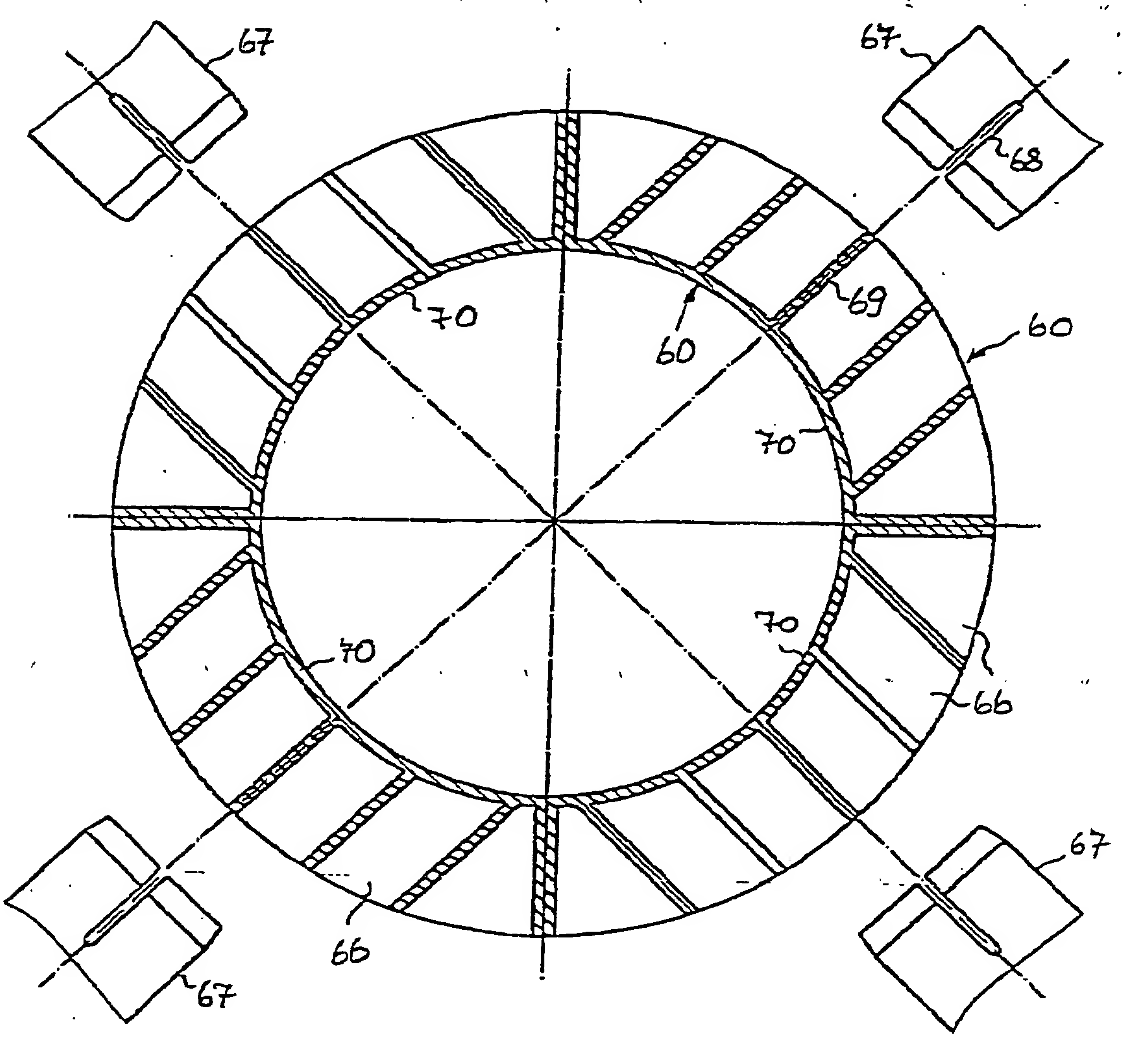

FIG. 17

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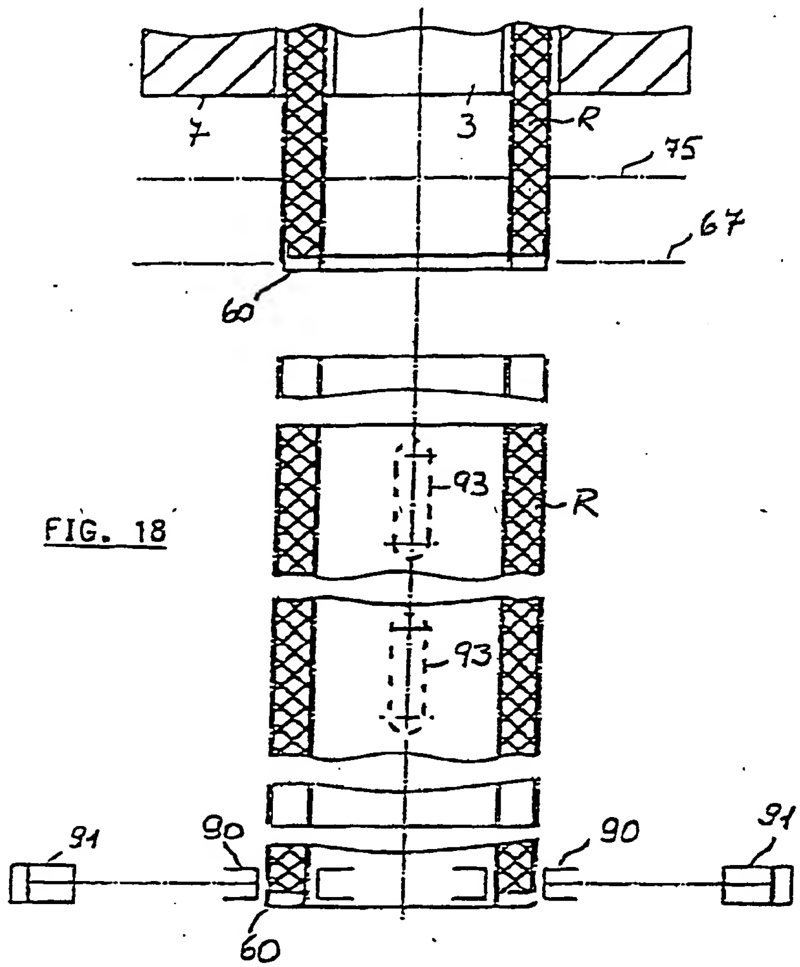

FIG. 18

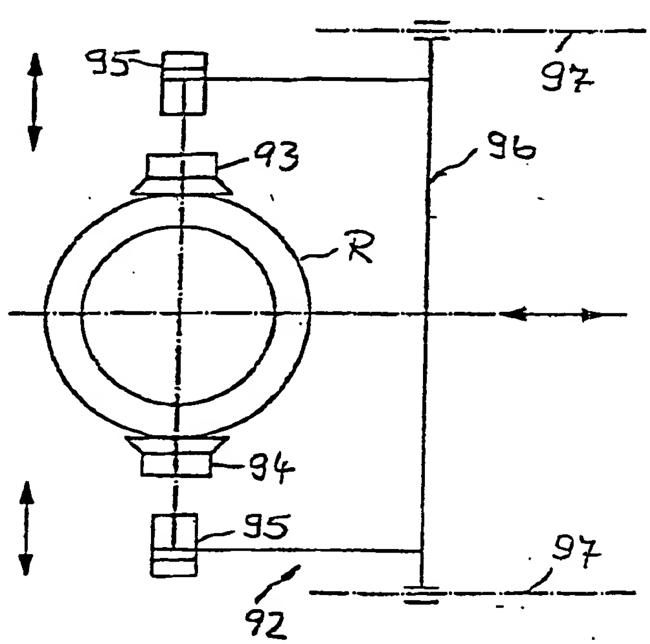

FIG. 19

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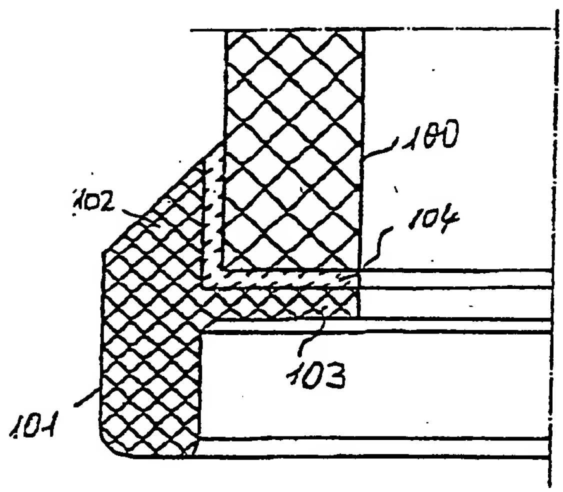

FIG. 20

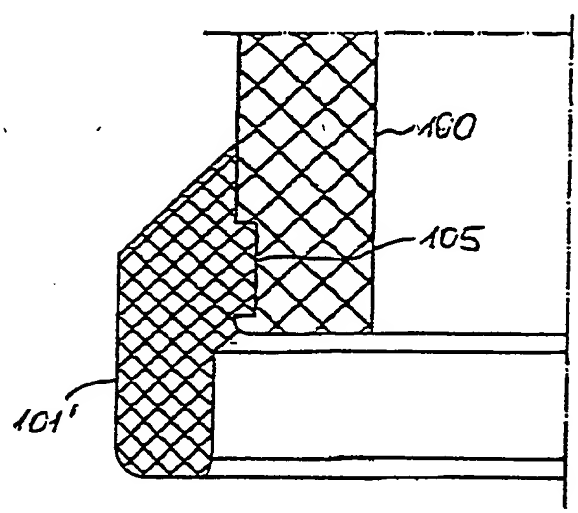

FIG. 21

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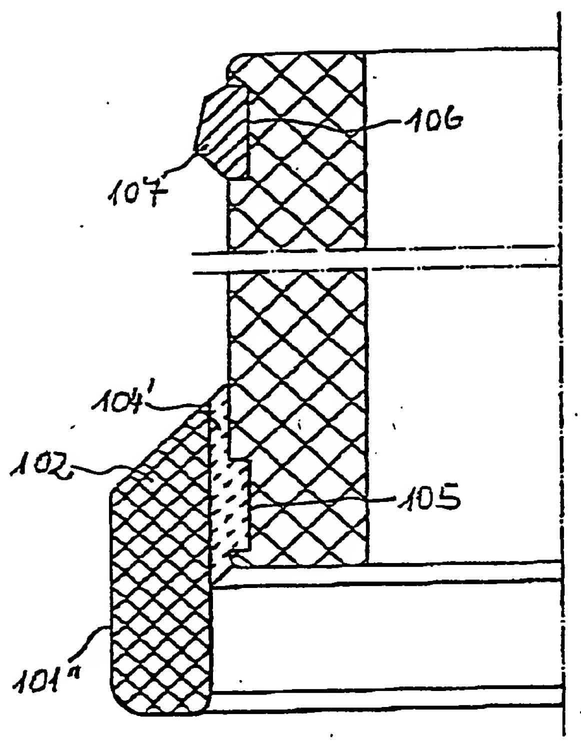

FIG. 22

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